

REMARKS

Claims 16-33 are pending in the present application. Claims 16-28 are rejected. Claims 1-15 were previously cancelled. Claims 29-33 were previously withdrawn. Claims 16 and 24 have been amended. Claim 29 was previously withdrawn and is currently amended. No new matter has been added.

Applicants thank Examiner Nadav for all the courtesies extended Applicants' representative during the May 22, 2008 telephone interview. During the interview, Applicants' representative discussed unintended differences in the formal replacement Figures 1F, 1G, 1H, and 1I. Applicants' representative agreed to consider amending the drawings with the original Figures 1F, 1G, 1H, and 1I to further prosecution. Further, the Examiner explained his interpretation of the reference Kinugawa Figure 3C, as it relates to claim 16. The Examiner stated that he interprets the conductivity of the first type to be the n type substrate in Figure 3C and not the p type "surface of the substrate" or well region. Accordingly, Applicants agreed to consider changes to the claims to accommodate the Examiner's interpretation. Moreover, the prior art of record and the manner in which Kinugawa and Chen fail to teach or disclose the features recited in the presently claimed embodiments in independent claims 16 and 24 was discussed. The arguments discussed as well as additional reasons that the claims are not obvious are set forth in the remarks below.

Applicants respectfully request reconsideration of the claims in view of the following amendments and remarks.

OBJECTION TO SPECIFICATION

The specification was objected to by the Examiner under 35 U.S.C. § 132 (a) because allegedly amendments filed December 22, 2006 and April 24, 2007 to paragraph [0025] introduces new matter into the disclosure. However, the amendment to paragraph [0025] is supported by original claim 16. The Examiner objected to paragraph [0025] stating, ““such that the notched spacer is thinner along the surface of the substrate, as illustrated in FIG. 1j,” is new matter.”

MPEP 608.01(l) states, “In establishing a disclosure, applicant may rely not only on the description and drawing as filed, but also on the original claims if their content justifies it.” Claim 16, as originally filed, recites in part, “forming a notched spacer alongside the gate electrode such that the notched spacer is thinner along the surface of the substrate ...,” and accordingly, provides the necessary support for amended paragraph [0025].

The amendment to paragraph [0025] adds only language found in originally filed claim 16 and a reference to the new figure. Specifically, Applicants amendment to paragraph [0025] recites, “In other situations, a portion of the first dielectric layer 126 may remain on the side of the gate electrode 122 such that the notched spacer is thinner along the surface of the substrate, as illustrated in Fig. 1j.” Claim 16, as originally filed, recites in part, “forming a notched spacer alongside the gate electrode *such that the notched spacer is thinner along the surface of the substrate ...*,” and accordingly, provides support for the amendment to paragraph [0025]. Thus, no new matter has been added. This objection has been traversed, and therefore Applicants respectfully request reconsideration of the amendments.

OBJECTION TO DRAWINGS

The drawings were objected to by the Examiner because the Examiner alleges that Figures 1F, 1G, 1H, 1I and 1j introduce new matter. The Applicants disagree. Figures 1F, 1G, 1H, and 1I were not amended. The formal drawings were submitted with no intended amendments. Therefore, a request to amend the drawings by replacing the formal drawings with the original Figures 1F, 1G, 1H, and 1I is included in this response.

Figure 1j was added as a new figure in a previous amendment to overcome the Examiner's 112 rejection. Figure 1j was added to further prosecution. Figure 1j has support in the specification and the claims. Figure 1j shows a notched spacer alongside the gate electrode, such that the notched spacer is thinner along the surface of the substrate. Therefore, Figure 1j is supported by original claim 16 and paragraph [0025], as well as original paragraph [0010].

REJECTION OF CLAIMS - 112 FIRST PARAGRAPH

Claims 16-28 have been rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. Applicants respectfully traverse the rejection.

Amended claim 16, and, by dependence, claims 17-23, require "forming a notched spacer alongside the gate electrode such that a thickness of the notched spacer alongside the gate electrode is thinner near the substrate," The Examiner asserted, in non-final Office Action dated March 26, 2008, that "There is no support in the specification as filed, for the claimed limitations of "a thickness of the notched spacer alongside the gate electrode is thinner near the substrate". However, there is clear support for this claim element in Figures 1D and 1E and paragraphs [0010], [0024], and [0025] of the specification as originally filed.

Paragraph [0010] states, "... a notched spacer is formed alongside the gate electrode such

that a portion of the notched spacer is completely, or partially removed along the corner formed between the surface of the substrate and the gate electrode sidewall.” Clearly, a notched spacer partially removed along the corner formed between the surface of the substrate and the gate electrode is “thinner along the surface of the substrate.”

Applicants disagree with the Examiner’s assertions. To those of ordinary skill in the art, it is obvious that a notched area is a thinner area. The ordinary and plain meaning of the word “notched” means an indentation, not a protrusion. Paragraph [0025] and Figures 1D and 1E are reproduced below.

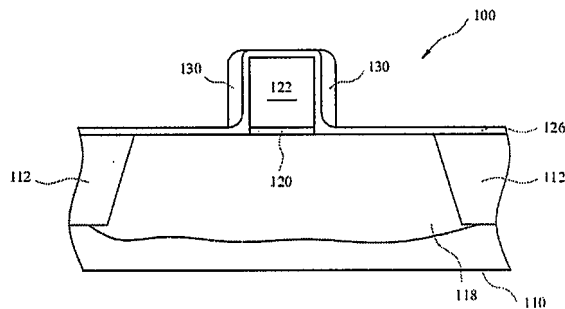


FIG. 1D

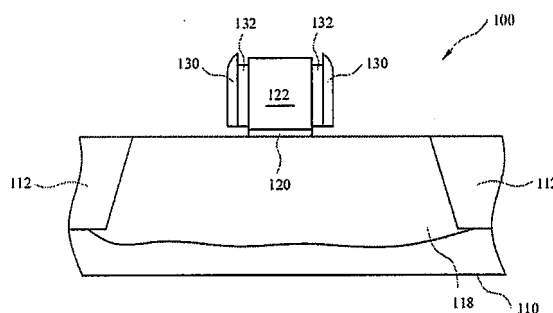


FIG. 1E

Originally filed Figures 1D and 1E.

As illustrated in FIG. 1E, the portion of the first dielectric layer 126 (FIG. 1D) located under the notched-spacer masks 130 is removed due to the isotropic etching process, thereby creating a notched spacer. The width of the notch will be dependent upon the thickness of the first dielectric layer 126 and the notch height may be controlled by varying the etch duration. Furthermore, FIG. 1E illustrates the situation in which the first dielectric layer 126 is removed completely to the gate electrode 122. In other situations, a portion of the first dielectric layer 126 may remain on the side of the gate electrode 122. This may be desirable, for example, when it is preferred to control the depth and angle of the

implant or to protect the gate electrode 122 or gate dielectric 120 from damage during the etching process or other processes.
Originally filed paragraph [0025]. [Emphasis added.]

As paragraph [0025] states, “the notch height may be controlled by varying the etch duration.” The layer 126 (for example SiO_2) alongside the gate electrode near the substrate is not protected by a mask; therefore, it is easily recognized, by one of ordinary skill in the art, that it is the thickness of the notched spacer alongside the gate electrode near the substrate that is controlled by varying the etch duration. Those of ordinary skill in the art will further understand that the portion of the first dielectric layer 126 (the notch height), located under the notched-spacer masks 130 may remain on the side of the gate electrode 122. An isotropic etch tends to clear the thickest portion of a dielectric layer last. Thus, it follows that an etch of relatively short duration may leave a portion of dielectric layer 126 on the lower portion of the side of the gate electrode 122, and an etch of relatively long duration may leave substantially no portion of layer 126 alongside the gate electrode near the substrate.

Therefore, within the specification as originally filed is the description of a method to control the thickness of the notch alongside the gate electrode near the substrate. The Examiner’s allegation that the claim element “a thickness of the notched spacer alongside the gate electrode is thinner near the substrate,” is not taught in the specification is incorrect.

Moreover, it is clear to one of ordinary skill in the art that; 1) the spacer is alongside the gate electrode, 2) the area of the spacer that is unprotected by the mask is the area of the spacer that is etched, and 3) the area of the spacer that is unprotected by the mask is along the surface of the substrate. Therefore, to one of ordinary skill in the art, thinner along the surface of the

substrate does indeed state that the notched spacer is thinner alongside the gate electrode near the substrate. Amended claim 16, reciting, “forming a notched spacer alongside the gate electrode such that a thickness of the notched spacer alongside the gate electrode is thinner near the substrate,” is supported at least by original paragraphs [0010] and [0025].

Further, even if the Examiner finds that claim 16 is not sufficiently supported in the original specification, MPEP 608.01(I) states, “In establishing a disclosure, applicant may rely not only on the description and drawing as filed, but also on the original claims if their content justifies it.” Claim 16, as originally filed, recites in part, “forming a notched spacer alongside the gate electrode such that the notched spacer is thinner along the surface of the substrate ...”, and accordingly, provides the necessary support for amended claim 16 which states, “forming a notched spacer alongside the gate electrode such that a thickness of the notched spacer alongside the gate electrode is thinner near the substrate...”

Thus, amended claim 16, and dependant claims 17-23 are supported by the original specification in paragraphs [0010], [0025] and Figures 1D and 1E. Applicants respectfully traverse the rejection of claim 16. Since claims 17-23 depend from claim 16, the same arguments as the independent claim 16 apply to these dependent claims. Therefore, the rejection of claims 17-23 has been traversed.

The Examiner’s rejection of claim 24 may be overcome by an argument similar to the argument for claim 16 above. Removing at least a portion of the first layer along a surface of the substrate may be found in paragraphs [0010], [0024], and [0025]. Thereby forming a notch in the notched spacer alongside the gate electrode near the substrate may be found in Figures 1E, 1F, 1H, 1I, and paragraphs [0010], [0024], [0025], and [0026].

To continue with the 112 First Paragraph rejection of claim 16, the Examiner states, “There is no support in the disclosure and in the drawings for the claimed limitations of “performing a first ion implant wherein only the gate electrode and the notched spacer act as masks.”

Claim 16 requires in part, “performing a first ion implant wherein only the gate electrode and the notched spacer act as masks during the first ion implant, the first ion implant using ions of the first conductivity type.” Support for these claimed limitations are found at least in Figure 1F and paragraphs [0027] and [0028], shown below.

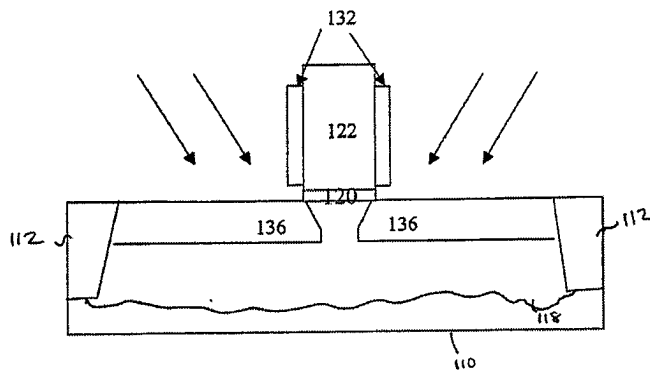


Fig. 1f

Figure 1F.

As can be seen in Figure 1F the implant is performed with only the gate electrode and the notched spacer acting as masks. Further paragraph [0027] states, “As one skilled in the art will appreciate, by removing the notched-spacer masks 130 prior to forming the implant regions... (Emphasis added).” Therefore, there is clear support for the limitations of performing a first ion implant wherein only the gate electrode and the notched spacer act as masks in both the figures and the specification.

REJECTION 112 SECOND PARAGRAPH

Claims 16-28 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 16, the Examiner states, “a thickness of the notched spacer alongside the gate electrode is thinner near the substrate, as recited in claim 16, are unclear from which element the notched spacer alongside the gate electrode is thinner than.” As original claim 16 stated and as paragraph [0025] clarifies, “the notched spacer is thinner along the surface of the substrate.”

Regarding claim 24, the Examiner states, “the etching process removing at least a portion of the first layer along a surface of the substrate, as recited in claim 24, are unclear as to how removing at least a portion of the first layer along a surface of the substrate relates to the etching process. It is further unclear as to which etching process applicant refers.” Applicants have amended claim 24 as follows: “etching the first layer to form a notched spacer wherein the spacer mask acts as a mask, the etching removing at least a portion of the second layer along the surface of the substrate.”

REJECTION 103(a) over Schuegraf in view of Kinugawa (Claims 16 and 23).

Claims 16 and 23 have been rejected under 35 U.S. C. § 103(a) as assertedly being unpatentable over Schuegraf, *et al.* (U.S. Patent No. 7,009,264, hereinafter “Schuegraf”) in view of Kinugawa (U.S. Patent No. 5,215,936, hereinafter “Kinugawa”). Applicants respectfully traverse these rejections.

The Examiner states, “Schuegraf *et al.* do not teach performing a first ion implant wherein only the gate electrode and the notched spacer act as masks during the first ion implant, the first ion implant using ions of the first conductivity type.” The Examiner continues by stating, “Kinugawa teaches in figure 3C and related text performing a first ion implant wherein only the gate electrode 15 and the spacer 17A act as masks during the first ion implant, the first ion implant using ions of the first conductivity type N in a substrate having a first conductivity type N.” Applicants disagree. Amended claim 16 states “forming a gate electrode on a region in a substrate, the region in the substrate having a first conductivity type.”

Kinugawa does not teach performing a first ion implant using ions of the first conductivity type, wherein only the gate electrode and the spacer act as masks, as seen from the text quoted from Kinugawa below.

A step of ion-implanting an impurity into the semiconductor body with the gate electrode as a mask, followed by a thermal treatment to form first and second impurity regions of the opposite conductivity type in surface portions of the semiconductor body, a step of forming an insulating member on the first and second impurity regions so as to be in contact with at least the side wall of the gate electrode, and a step of ion implanting an impurity of the opposite conductivity type into the first and second impurity regions with said first gate and insulating member as a mask.

Kinugawa, Column 2, lines 57-68.

Kinugawa above describes implanting an n- region into a p type surface portion of the semiconductor body (a p-well structure), forming sidewalls, and then implanting an n⁺ region into the p-well structure. In contrast, claim 16 requires “performing a first ion implant ... using ions of the first conductivity type,” where the substrate has a first conductivity type. Thus, according to the present specification, an N-channel device receives a p-type implant, because the substrate of an N-channel device is p-type and a P-channel device receives an n-type implant, because the substrate of a P-channel device is n-type. Therefore, Kinugawa does not teach performing a first ion implant ... using ions of the first conductivity type. Thus, neither Schuegraf nor Kinugawa either alone or in combination teach all of the limitations of claim 16. Moreover, even if the references could be properly combined, the combination of the references would not form the presently claimed invention. The rejection to claim 23 is overcome at least due to the dependency of claim 23 on claim 16.

REJECTION 103(a) over Schuegraf in view of Kinugawa and in further view of Chen (Claims 17 and 18).

Claims 17 and 18 have been rejected under 35 U.S. C. § 103(a) as assertedly being unpatentable over Schuegraf and Kinugawa as applied to claim 16 above, and further in view of Chen, *et al.* (U.S. Patent No. 6,610,571, hereinafter “Chen”). Applicants respectfully traverse these rejections. Claims 17 and 18 are dependent on claim 16, thus by at least the reason of their dependency the rejection of claims 17 and 18 are traversed.

REJECTION 103(a) over Singh in view of Kinugawa (Claims 16, 17, 19-22).

Claim 16 has been rejected under 35 U.S. C. § 103(a) as assertedly being unpatentable over Singh, *et al.* (U.S. Patent No. 6,417,084, hereinafter “Singh”). Applicants respectfully traverse these rejections. The Examiner concedes that, “Singh et al. do not teach performing a first ion implant wherein only the gate electrode and the notched spacer act as masks during the first ion implant, the first ion implants using ions of a second conductivity type.” Rather, once again, the Examiner points to Kinugawa. As discussed above, Kinugawa does not teach the implant limitations as claimed. Therefore, neither Singh nor Kinugawa teach all of the limitations found in claim 16, therefore, the rejection of claim 16 has been traversed. The rejection of claims 17, 19-22 at least by virtue of their dependency on claim 16 has also been traversed.

REJECTION 103(a) over Chen in view of Kinugawa (Claims 24-28).

Claims 24 and 27-28 have been rejected under 35 U.S. C. § 103(a) as assertedly being unpatentable over Chen in view of Kinugawa. Applicants respectfully traverse these rejections.

Chen specifically teaches away from claim 24. “Due to the loss of liner oxide in these regions 54, device isolation and device performance is negatively affected, this loss of liner oxide must therefore be avoided.” (Chen, Column 4, lines 39-42). See Chen Figure 4 below.

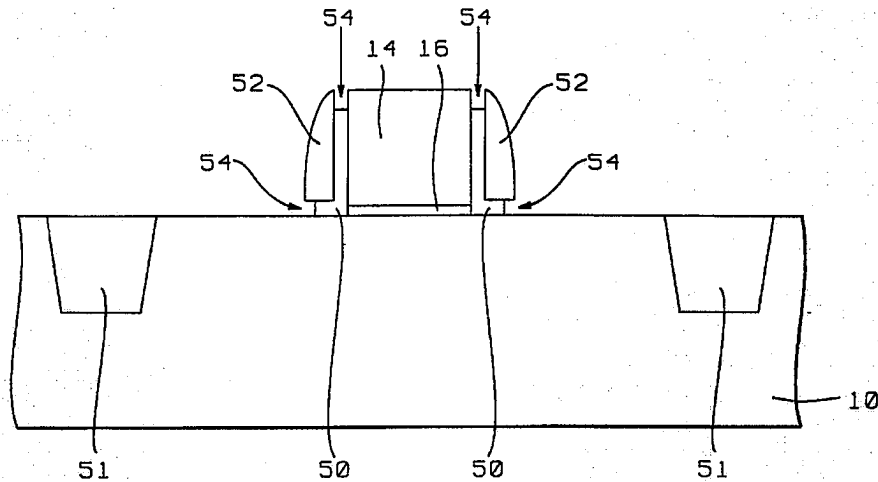


FIG. 4 - Prior Art

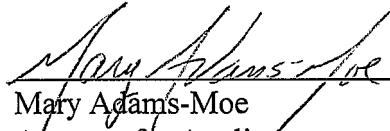
Chen, Figure 4.

As can be seen from Figure 4, it is regions 54 that Chen cautions against etching. The oxide liner is thereby formed into an L shape. This is the opposite of the notched spacer recited by Applicants' specification. Therefore, Chen teaches away, in fact cautions against, the modification proposed in the Office Action. A reference may be said to "teach away" from the claimed invention when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the Applicants. This is clearly the case for Chen. Moreover, the short comings of Kinugawa have been discussed above and will not be discussed further here. Therefore, neither Chen nor Kinugawa teach all of the claim limitations of claim 24. Further Chen teaches away from claim 24. Thus, the rejection of claim 24 has been overcome. Since claims 25-28 depend from claim 24, the rejection of claims 25-28 are overcome at least by their dependency on claim 24.

Applicants have made a diligent effort to place the claims in condition for allowance. However, should there remain unresolved issues that require adverse action, it is respectfully requested that the Examiner telephone Mary Adams Moe, Applicants' Attorney, at 972-732-1001 so that such issues may be resolved as expeditiously as possible. No fee is believed due in connection with this filing. However, should one be deemed due, the Commissioner is hereby authorized to charge, or credit any overpayment, Deposit Account No. 50-1065.

Respectfully submitted,

6-24-08
Date


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